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PATENT APPLICATION

ATTORNEY DOCKET NO. 100201650-1

IN THE
 UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Jeffrey Allen Neilsen, et al.

Confirmation No.: 4887

Application No.: 10/603,896

Examiner: Leo B. Tentoni

Filing Date: June 24, 2003

Group Art Unit: 1732

Title: **METHODS AND SYSTEMS FOR PRODUCING IMPROVED COLORING IN AN OBJECT PRODUCED THROUGH SOLID FREEFORM FABRICATION**

Mail Stop Appeal Brief-Patents
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 PO Box 1450
 Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on February 1, 2007.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00. Appellants request that the previously paid Notice of Appeal fee and Appeal Brief fee be applied to the instant appeal.
 (complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month
 \$120

☐ 2nd Month
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☐ 3rd Month
 \$1020

☐ 4th Month
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☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of \$ 0. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Date of facsimile: February 1, 2007

Typed Name: Matthew B. McNutt

Signature: Matthew B. McNutt

Respectfully submitted,

Jeffrey Allen Neilsen, et al.

By Matthew B. McNutt

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FEB 01 2007**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Jeffrey Allen Neilsen et al.

Examiner: Leo B. Tentoni

Serial No.: 10/603,896

Group Art Unit: 1732

Filed: June 24, 2003

Docket No.: 100201650-1

Title: METHODS AND SYSTEMS FOR PRODUCING IMPROVED COLORING
IN AN OBJECT PRODUCED THROUGH SOLID FREEFORM FABRICATION**APPEAL BRIEF**Mail Stop: Appeal Brief-Patents
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Alexandria, VA 22313-1450**CERTIFICATE OF MAILING OR TRANSMISSION [37 CFR § 1.8(a)]**

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- ☒ transmitted by facsimile on the date shown below to the United States Patent and Trademark Office at 571-273-8300.

February 1, 2007
Date
Signed by: Matthew B. McNutt

Dear Sir:

This is an appeal from the Office Action mailed on November 3, 2006, re-opening prosecution after filing of the Appeal Brief on August 29, 2006. A Notice of Appeal is filed herewith.

Claims 1-19 were finally rejected in the Office Action mailed March 14, 2006, and the finality of the rejection was maintained in the Advisory Action mailed May 17, 2006. A Notice of Appeal was filed with the USPTO on June 15, 2006, and an Appeal Brief was filed on August 29, 2006.

Appellants request that the previously paid Notice of Appeal fee and Appeal Brief fee be applied to the instant appeal. If any additional fees are required under 37 CFR § 41.20(b) for filing a Notice of Appeal and Appeal Brief, such fees should be charged to Deposit Account No. 08-2025.

Appellants request the opportunity for a personal appearance before the Board of Appeals to argue the issues of this appeal. The fee for the personal appearance will be timely paid upon receipt of the Examiner's Answer.

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I. REAL PARTY IN INTEREST

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. RELATED APPEALS AND INTERFERENCES

Appellant is unaware of other prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS

Claims 1-47 are pending. Claims 20-47 have been withdrawn from consideration pursuant to 37 CFR 1.142(b) as being drawn to a non-elected invention. Claims 1-19 were finally rejected in the Office Action mailed March 14, 2006. A Notice of Appeal was filed with the USPTO on June 15, 2006, and the corresponding Appeal Brief was filed on August 29, 2006. The Office Action mailed on November 3, 2006, re-opened prosecution to enter a new grounds of rejection. The new rejections of claims 1-19 are being appealed.

IV. STATUS OF AMENDMENTS

No amendments have been filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The Summary is set forth as an exemplary embodiment of the language corresponding to independent claim 1. Discussions about elements of claim 1 can be found at least at the cited locations in the specification and drawings.

The present invention, as claimed in independent claim 1, provides a method of improving color quality in an object created by a solid freeform fabrication system that uses a fluid ejection process to build successive layers of the object being fabricated. The method comprises ejecting a first material to form a layer of a three-dimensional object. The first

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material contains a colorant. A reaction is caused that keeps the colorant near a surface of the object.

Illustrative implementations of the subject matter of claim 1 are described in the specification, e.g., at p. 9, line 5 through p. 13, line 5, and Figs. 2-5.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**VI.A. First Grounds of Rejection**

Claims 1-19 stand rejected under 35 U.S.C. §112, second paragraph, as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

VI.B. Second Grounds of Rejection

Claims 1-19 stand rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over Jang et al. (U.S. Patent No. 6,401,002 B1) in combination with either Shields et al. (Shields I, U.S. Patent No. 5,181,045 A) or Shields et al (Shields II, U.S. Patent No. 5,428,383).

VII. ARGUMENT**VII.A. First Grounds of Rejection**

Claims 1-19 stand rejected under 35 U.S.C. §112, second paragraph, as purportedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention. Specifically, the instant Office Action asserts that in claim 1, line 6 (last line), the expression "near a surface of the object" renders the claims indefinite principally because it is not clear what applicant intends to claim by such recitation (e.g., it is not clear what the distance or range of distance from the object surface the colorant is kept).

Appellants assert that the rejection of claims 1-19 under 35 USC §112 should be reversed based on the following. The specification of the application states at page 7, line 23 through page 8, line 12:

Because color can be primarily a surface property, the color projection of the object does not need to proceed very far into the interior of the object being fabricated. The necessary depth of the coloring will depend on the base material being used to fabricate the object. Materials that are more translucent may require projecting the color deeper into the object. In powder-based

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binder-jetting systems, the powder build material is typically not completely transparent and is somewhat turbid or translucent or opaque.

By way of further explanation, consider a point on an object. The color of a point on a layer of the object is determined by the color at that point and the colors of the points adjacent to that point in the same layer of the object (half toning). The color of the point is also affected by the color of points nearby in layers above and below. The fact that the color at any given point is affected by the color of all surrounding points is specific to the three-dimensional nature of rapid prototyping.

The present invention provides for the improvement of color quality in objects created by a solid free-form fabrication system that uses a fluid ejection process to build successive layers of the object being fabricated. Colorant in the ejected material (either an ejected binder or an ejected build material) is caused to remain near the surface of the layer being fabricated, such that the color accuracy of the layer, and thus the completed object, is improved by, for example, reducing "washed out" colors and maintaining sharp and crisp borders between different colors in the object.

Appellants respectfully assert that in view of at least the above-quoted portion of the instant specification, one skilled in the art would understand the expression "near a surface of the object" as used in the claims. Specifically, one skilled in the art would understand that colorants are kept within a distance from the object surface that is sufficient to maintain the desired color quality, such as sharp and crisp borders between different colors in the object. One skilled in the art would further understand that the distance depends on the base material being used to fabricate the object.

For at least these reasons, withdrawal of the rejection under 35 U.S.C. 112, second paragraph is respectfully requested.

VII.B. Second Grounds of Rejection

Claims 1-19 stand rejected under 35 U.S.C. §103(a) as purportedly being unpatentable over Jang et al. (U.S. Patent No. 6,401,002 B1) in combination with either Shields et al. (Shields I, U.S. Patent No. 5,181,045 A) or Shields et al (Shields II, U.S. Patent No. 5,428,383).

Appellants assert that the rejections of claims 1-19 under 35 USC §103(a) should be reversed based on the following:

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VII.B.1. Jang et al. in combination with Shields I

In the rejection of claims 1-19 over Jang et al. in combination with Shields I and Shields II, the November 3, 2007, Office Action states:

Jang et al (see the entire document, in particular, col. 5, lines 45-54; col. 7, lines 30-40; col. 8, lines 27-39) teaches a solid freeform fabrication process of making an object including ejecting a first material to form a layer of an object wherein the layer contains a colorant, except that Jang et al. do not explicitly teach causing a reaction that keeps a colorant near a surface of an object, which is taught by Shields I (see the entire document, in particular, col. 2, lines 1-11; col. 2, line 26 to col. 3, line 44) and Shields II (see the entire document, in particular col. 3, lines 15-49) (note that Shields I and Shields II, like the instant application, teach causing a reaction (precipitation or "crashing") which prevents the colorant from migrating (or "bleeding") to an undesired area and thus, the colorant will remain in a desired area (at or near a surface of the formed object, so that the coloring is visible)) and such would have been obvious to one of ordinary skill in the art at the time the invention was made in the process of Jang et al in view of either Shields I or Shields II principally in order to provide an object having a desired color and/or desired color pattern.

(Office Action mailed November 3, 2006, at para. 6).

The above-quoted portion of the instant Office Action repeats, nearly verbatim, rejections originally made of record in the Office Action mailed October 12, 2005, and repeated in the Final Office Action mailed March 14, 2006 (see Office Action mailed October 12, 2005 at page 6, lines 7-23; and Final Office Action mailed March 14, 2006 at para. 5). Specifically, the Office Action mailed October 12, 2005, states in part:

Jang et al (see the entire document, in particular, col. 5, lines 45-54; col. 7, lines 30-40; col. 8, lines 27-39) teach a solid freeform fabrication process of making an object by ejecting a first material containing a colorant as claimed, except that Jang et al do not explicitly teach causing a reaction that keeps the colorant near the surface of the object, which is taught by Shields et al (see the entire document, in particular, col. 2, lines 1-11; col. 2, line 26 to col. 3, line 44) . . . (note that Shields et al . . . teach causing a reaction that keeps the colorant near a surface of the formed object (by "crashing" or precipitating the colorant out of the material)) and such would have been obvious to one of ordinary skill in the art at the time the invention was made in the process of Jang et al in view of . . . Shields et al . . . principally in order to provide an object having a desired color.

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(Office Action mailed October 12, 2005, at page 6, lines 7-23, where "Shields et al." refers to Shields I).

The Final Office Action mailed March 14, 2006, also states in part:

... Shields et al. teach 'crashing' or precipitating a colorant out of a material, which will keep a colorant near a surface of a formed object (note page 8, lines 1-18 of the instant specification). While Shields et al. may also be concerned with a different problem (i.e., preventing or reducing the mixing of two different ink colors at a common border of the two inks), this does not in any way diminish the teaching of Shields et al, and one of ordinary skill in the art would look to Jang et al. and Shields et al. for teachings on how to provide an object having a desired color.

(Final Office Action mailed March 14, 2006, para. 7, where "Shields et al." refers to Shields I).

Referring to Section 706.02(j) of the MPEP, to establish a *prima facie* case of obviousness, three basic criteria must be met:

- (1) There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference to combine reference teachings;
- (2) There must be reasonable expectation of success;
- (3) The prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Appellant's disclosure. See *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (F.E.D. Cir. 1991).

Appellants respectfully submit that the combination of Jang et al. and Shields I cannot support a case of *prima facie* obviousness as to claims 1-19 because, among other possible reasons, the references fail to disclose all of the elements of the present invention, there is no motivation to combine the reference teachings, and one skilled in the art would have no reasonable expectation of success when combining the references as suggested in the instant Office Action.

Jang et al. teach a freeform fabrication process having several different embodiments. The process includes depositing a solidifiable liquid composition (also referred to in Jang et al. as a "baseline material" and also as a "body-building material") such as adhesives, waxes, thermoplastic polymers, etc., that becomes the primary constituent material in the object being formed. In one embodiment, the solidifiable liquid composition contains a colorant already mixed in. (Jang et al, col. 8, lines 45-47). In another embodiment, a selected color

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ink is mixed with the liquid composition just prior to being deposited. (Jang et al, col. 8, lines 31-33). In other embodiments, droplets of the baseline material are deposited simultaneously or sequentially with the droplets of a color ink. (Jang et al, col. 8, lines 33-35).

With respect to the embodiments of Jang et al. in which the droplets of the baseline material are deposited simultaneously or sequentially with the droplets of a color ink, clearly Jang et al. fail to teach at least the claim element "ejecting a first material to form a layer of a three-dimensional object, the first material containing a colorant", as the baseline material of Jang et al. does not contain a colorant in those embodiments. Shields I fails to remedy this deficiency of Jang et al., as Shields I also fails to disclose "ejecting a first material to form a layer of a three-dimensional object, the first material containing a colorant."

With respect to the embodiments of Jang et al. in which the solidifiable liquid composition contains a colorant already mixed in, or a selected color ink is mixed with the liquid composition just prior to being deposited, the instant Office Action acknowledges that Jang et al. fail to teach causing a reaction that keeps the colorant near the surface of the object. (Office Action mailed Nov. 3, 2006, para. 6). The instant Office Action alleges that Shields I teaches causing a reaction that prevents the colorant from migrating to an undesired area, and one of ordinary skill in the art at the time the invention was made would use such a reaction in the process of Jang et al. in order to provide an object having a desired color and/or a desired color pattern. (Office Action mailed Nov. 3, 2006, para. 6)

Appellants respectfully submit that Shields I in fact fails to remedy the acknowledged deficiencies of Jang et al. Shields I teaches pH-sensitive ink compositions with improved ability to resist mixing of one color with another color when both colors are printed in close succession on a print medium such as paper. (Shields I, col. 2, line 57 to col. 3, line 1). In particular, Shields I teaches that by forcing a dye to become insoluble, migration of the dye will be inhibited and bleed between different colors will be reduced. (Shields, I, col. 2, lines 32-36). Thus, when inks of two different colors are printed next to each other, the border between the two colors remains clean and free from the invasion of one color into the other. (Shields I, col. 1, lines 47-57). Put another way, Shields I teaches a method for preventing or reducing mixing of two different ink colors at a common border of the two inks. (Shields I, col. 2, line 66 through col. 3, line 1).

However, Appellants respectfully submit that forcing dyes to become insoluble at a common border to prevent mixing of two different ink colors on a print medium is not the

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same as causing a reaction that keeps a colorant near a surface of a three-dimensional object, as set forth in claim 1 of the instant application. Shields I is concerned only with the border shared by two adjacent inks. Shields I makes no teaching or suggestion regarding keeping colorant of the inks near a surface of the print medium (e.g., the surface of the paper). Rather, Shields I is indifferent as to the location or migration of the dyes except for along a common border between two different ink colors. In fact, dyes in Shields I are free to migrate away from the common border. Thus, Appellants respectfully submit that even if the teachings of Jang et al. and Shields I were combined, at best the result would be that colorants in the material of Jang et al. would be prevented from migrating into colors of adjacent layers of the object. This is not the same as keeping the colorant near a surface of the object, as the modified process of Jang et al. would still permit colorants to migrate into the deposited layer and away from the surface of the object. Appellants respectfully submit it is only the instant application that teaches causing a reaction that keeps the colorant near a surface of the object. For at least these reasons, the combination of Jang et al. and Shields I fail to teach or suggest all the limitations of claim 1 of the instant application.

In addition, contrary to the position set forth by the Examiner, Appellants respectfully submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify and combine the references as suggested in the instant Office Action. Further, Appellants submit that the knowledge generally available to one of ordinary skill in the art and the teachings of the cited references themselves would lead one skilled in the art to believe there was no reasonable expectation of success if the references were combined as suggested in the instant Office Action.

In another patent to Jang et al. (U.S. Patent No. 6,165,406, filed May 27, 1999), it is noted that earlier patents "failed to recognize critical differences between traditional 2-D color inkjet printing and 3-D inkjet-based [rapid prototyping] processes." (Jang et al. '406, col. 6, lines 29-31). Thus, Jang et al. '406 teaches one skilled in the art that 2-D printing techniques (as taught in Shields I, for example) are not necessarily useful or applicable to 3-D rapid prototyping processes. Notably, the Jang et al. '002 patent applied in the instant rejection was filed *before* the Jang et al. '406 patent quoted above.

Similarly, Shields I teaches that seemingly similar problems (such as waterfastness and bleed resistance) may not necessarily be overcome with similar solutions, noting, "Having solved one problem does not imply a solution to the other." (Shields I, col. 2, lines

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59-61). Thus, one skilled in the art would understand that the Shields I method to increase bleed resistance at the border of two inks does not necessarily imply a solution for causing a reaction that keeps a colorant near a surface of a 3-D object.

For at least these reasons, one skilled in the art would not combine and modify the references as suggested in the instant Office Action, and one skilled in the art would have no reasonable expectation of success if the references are combined as suggested in the Office Action.

For at least the reasons provided above, the combination of Jang et al. and Shields I cannot support a 35 U.S.C. 103(a) rejection of claim 1, and withdrawal of the rejection is respectfully requested.

Claims 2-19 each depend, either directly or indirectly, from independent claim 1 which is in allowable condition for at least the reasons set forth above. Accordingly, dependent claims 2-19 are also in allowable condition, and withdrawal of the rejection under 35 U.S.C. §103(a) is respectfully requested.

VII.B.2. Jang et al. in combination with Shields II

As with the combination of Jang et al. and Shields I above, Appellants respectfully submit that the combination of Jang et al. and Shields II cannot support a case of *prima facie* obviousness as to claims 1-19 because, among other possible reasons, the references fail to disclose all of the elements of the present invention, there is no motivation to combine the reference teachings, and one skilled in the art would have no reasonable expectation of success when combining the references as suggested in the instant Office Action.

As set forth above, Jang et al. teach a freeform fabrication process having several different embodiments. The process includes depositing a solidifiable liquid composition (also referred to in Jang et al. as a "baseline material" and also as a "body-building material") such as adhesives, waxes, thermoplastic polymers, etc., that becomes the primary constituent material in the object being formed. In one embodiment, the solidifiable liquid composition contains a colorant already mixed in. (Jang et al, col. 8, lines 45-47). In another embodiment, a selected color ink is mixed with the liquid composition just prior to being deposited. (Jang et al, col. 8, lines 31-33). In other embodiments, droplets of the baseline material are deposited simultaneously or sequentially with the droplets of a color ink. (Jang et al, col. 8, lines 33-35).

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With respect to the embodiments of Jang et al. in which the droplets of the baseline material are deposited simultaneously or sequentially with the droplets of a color ink, clearly Jang et al. fail to teach at least the claim element "ejecting a first material to form a layer of a three-dimensional object, the first material containing a colorant", as the baseline material of Jang et al. does not contain a colorant in those embodiments. Shields II fails to remedy this deficiency of Jang et al., as Shields II also fails to disclose "ejecting a first material to form a layer of a three-dimensional object, the first material containing a colorant."

With respect to the embodiments of Jang et al. in which the solidifiable liquid composition contains a colorant already mixed in, or a selected color ink is mixed with the liquid composition just prior to being deposited, the instant Office Action acknowledges that Jang et al. fail to teach causing a reaction that keeps the colorant near the surface of the object. (Office Action mailed Nov. 3, 2006, para. 6). The instant Office Action alleges that Shields II teaches causing a reaction that prevents the colorant from migrating to an undesired area, and one of ordinary skill in the art at the time the invention was made would use such a reaction in the process of Jang et al. in order to provide an object having a desired color and/or a desired color pattern. (Office Action mailed Nov. 3, 2006, para. 6)

Appellants respectfully submit that Shields II in fact fails to remedy the acknowledged deficiencies of Jang et al. Similar to Shields I, Shields II teaches that when inks of two different colors are printed next to each other, the border between the two colors can remain free from invasion of one color into the other by forcing a precipitation reaction between ink compositions, such that migration of coloring agents is inhibited and bleeding between adjacent colors is reduced. (Shields II, col. 3, lines 57-66). Put another way, as with Shields I, Shields II teaches a method for preventing or reducing mixing of two different ink colors at a common border of the two inks.

Appellants respectfully submit that forcing a precipitation reaction between ink compositions at a common border thereof to prevent mixing of two different ink colors on a print medium is not the same as causing a reaction that keeps a colorant near a surface of a three-dimensional object, as set forth in claim 1 of the instant application. Shields II is concerned only with the border shared by two adjacent ink compositions. Shields II makes no teaching or suggestion regarding keeping colorants of the inks near a surface of the print medium (e.g., the surface of the paper). Rather, Shields II is indifferent as to the location or migration of the colorants except for along a common border between two different ink colors. In fact, colorants in Shields II remain free to migrate away from the common

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border. Thus, Appellants respectfully submit that even if the teachings of Jang et al. and Shields II were combined, at best the result would be that colorants in the material of Jang et al. would be prevented from migrating into colors of adjacent layers of the object. This is not the same as keeping the colorant near a surface of the object, as *the modified process of Jang et al. would still permit colorants to migrate into the deposited layer and away from the surface of the object.* Appellants respectfully submit it is only the instant application that teaches causing a reaction that keeps the colorant near a surface of the object. For at least these reasons, the combination of Jang et al. and Shields II fail to teach or suggest all the limitations of claim 1 of the instant application.

In addition, for the same reasons set forth above with regard to the combination of Jang et al. and Shields I, Appellants respectfully submit that there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify and combine Jang et al. and Shields II as suggested in the instant Office Action. Further, Appellants submit that the knowledge generally available to one of ordinary skill in the art and the teachings of the cited references themselves would lead one skilled in the art to believe there was no reasonable expectation of success if the references were combined as suggested in the instant Office Action.

For at least these reasons, one skilled in the art would not combine and modify the references as suggested in the instant Office Action, and one skilled in the art would have no reasonable expectation of success if the references are combined as suggested in the Office Action.

For at least the reasons provided above, the combination of Jang et al. and Shields II cannot support a 35 U.S.C. 103(a) rejection of claim 1, and withdrawal of the rejection is respectfully requested.

Claims 2-19 each depend, either directly or indirectly, from independent claim 1 which is in allowable condition for at least the reasons set forth above. Accordingly, dependent claims 2-19 are also in allowable condition, and withdrawal of the rejection under 35 U.S.C. §103(a) is respectfully requested.

VIII. CONCLUSION

For the foregoing reasons, appellants respectfully submit that the Examiner has erred in rejecting this application. Please reverse the Examiner on all counts.

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Any inquiry regarding this Appeal should be directed to either Jeff D. Limon at Telephone No. (541) 715-5979, Facsimile No. (541) 715-8581, or Matthew B. McNutt at Telephone No. (612) 767-2510, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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P.O. Box 272400
Fort Collins, Colorado 80527-2400

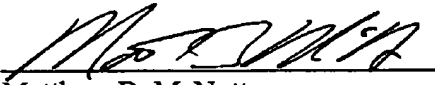
Respectfully submitted,

Jeffrey Allen Neilsen et al.,

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Date: February 1, 2007
MBM:kmh


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CLAIMS APPENDIX

1. (Previously Presented) A method of improving color quality in an object created by a solid freeform fabrication system that uses a fluid ejection process to build successive layers of the object being fabricated, the method comprising:

ejecting a first material to form a layer of a three-dimensional object, the first material containing a colorant; and

causing a reaction that keeps the colorant near a surface of the object.

2. (Original) The method of claim 1, wherein causing a reaction comprises precipitating the colorant out of the first material.

3. (Original) The method of claim 2, wherein causing a reaction further comprises providing a second material to precipitate the colorant out of the first material.

4. (Original) The method of claim 3, wherein ejecting a first material comprises ejecting a binder.

5. (Original) The method of claim 4, wherein providing a second material comprises ejecting a second binder.

6. (Original) The method of claim 4, wherein providing a second material comprises providing a powdered build material into which the first material is ejected.

7. (Original) The method of claim 3, wherein ejecting a first material comprises ejecting a solidifiable build material.

8. (Original) The method of claim 7, wherein providing a second material comprises ejecting a solidifiable support material.

9. (Original) The method of claim 2, wherein causing a reaction to precipitate the colorant out of the first material comprises causing a pH reaction.

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10. (Original) The method of claim 9, wherein the colorant in the first material is sensitive to pH, and wherein causing a pH reaction comprises providing a second material having a pH sufficiently different from a pH of the first material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.

11. (Original) The method of claim 10, wherein the pH of the second material is lower than the pH of the first material.

12. (Original) The method of claim 11, wherein the colorant in the first material is a dye selected from the group consisting of carboxylated azo dyes, carboxylated copper phthalocyanine dyes, carboxylated xanthene dyes, and dyes whose solubility decreases as pH is lowered.

13. (Original) The method of claim 10, wherein the pH of the second material is higher than the pH of the first material.

14. (Original) The method of claim 10, wherein the pH differential between the first material and the second material ranges from about 2.5 to 7 units.

15. (Original) The method of claim 2, wherein causing a reaction to precipitate the colorant out of the first material comprises causing an anionic-cationic reaction.

16. (Original) The method of claim 15, wherein the colorant of the first material is anionic, and wherein causing a reaction comprises providing a cationic second material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.

17. (Original) The method of claim 15, wherein the colorant of the first material is cationic, and wherein causing a reaction comprises providing an anionic second material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.

18. (Original) The method of claim 1, wherein the colorant is a dye.

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19. (Original) The method of claim 1, wherein the colorant is a pigment.

20-47. (Withdrawn)

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Evidence Appendix under 37 C.F.R. § 41.37(c)(1)(ix)

There is no extrinsic evidence to be considered in this Appeal. Therefore, no evidence is presented in this Appendix.

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Related Proceedings Appendix under 37 C.F.R. § 41.37(c)(1)(x)

There are no related proceedings to be considered in this Appeal. Therefore, no such proceedings are identified in this Appendix.